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DARBY & DARBY P.C.
P. O. BOX 5257
NEW YORK, NY 10150-5257

EXAMINER	
STREGE, JOHN B	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	✓10/057,756	IMAGAWA ET AL.	
	Examiner	Art Unit	
	Michael W. Bowen	2625	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 25 January 2002.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-35 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-5,7,10,14,17-21,27 and 30-35 is/are rejected.

7)☒ Claim(s) 6,8,9,11-13,15,16,22-26,28, and 29 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 25 January 2002 is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892) ✓

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) ✓
Paper No(s)/Mail Date 1/21/04

4)☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application (PTO-152)

6)☐ Other: _____.

DETAILED ACTION

Specification

1. The title of the invention is not descriptive. A new title is required that is clearly indicative of the invention to which the claims are directed.

The following title is suggested: Comparing Edges Between Two Images.

Drawings

2. The drawings are objected to because of the following informalities

a) Drawings with block diagrams (1, 9, 11, 15, 17, 19, 21, 24, 26, 28, and 30) do not have descriptive labels on blocks. Labels for inputs and outputs should be included.

b) Lines pointing to features are not labeled in figures 3, 7, 18(b), 23(a), and 28.

c) Fig. 7(b) is labeled as 7(a).

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief

description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by U.S. Patent 6,507,660 (Wirtz et al., hereinafter called Wirtz). Wirtz discloses the following:

An image processing method for evaluating matching between a

template image (col. 3, line 21) and an input image (i.e. video image, col. 3, line 22) by use of a similarity value map (i.e. correlation-surface array, col. 3, line 47), comprising:

generating a first evaluation vector for said template image (i.e. convert the gradient vector to a complex number of the form (edge strength)exp(2ι theta), col. 4, lines 24-25),

generating a second evaluation vector for said input image (see reference above for first evaluation vector); and

performing an even-number times angular transformation (see reference above, which shows the expression exp(2ι theta)) on a component of an edge normal direction vector (see "gradient vector" in the above reference) of said first and second evaluation vectors.

It is understood from Wirtz that a gradient vector can be represented as a complex number of the form (edge strength) exp (ι theta). This corresponds with the evaluation vectors of the claim.

5. Regarding claim 2, Wirtz reveals the following:

An image processing method comprising:

Inputting a specified image for a template image (i.e. reference image template, col. 3, line 21);

inputting a specified image for an input image (i.e. video image, col. 3, line 22),

calculating an edge normal direction vector of said specified image (i.e. gradient operation, col. 3, lines 6-7; gradient operator, col. 3, line 26);

generating an evaluation vector from said edge normal direction vector (refer to the rationale regarding evaluation vectors in the discussion of claim 1).

subjecting said evaluation vector to orthogonal transformation (i.e. Fourier transform, col. 3, line 41);

performing a product sum calculation of corresponding spectral data for each evaluation vector that has been subjected to orthogonal transformation and has been obtained for said template image said input image (i.e. multiplication of fast Fourier transform arrays, col. 3, lines 41-42);

subjecting a result of said product sum calculation to inverse orthogonal transformation (i.e. inverse transformation, col. 3, line 43) and generating a map of similarity values (i.e. correlation-surface array, col. 3, line 47); and

a formula of said similarity values, said orthogonal transformation, and said inverse orthogonal transformation each have linearity.

Since the similarity values, orthogonal transform, and inverse orthogonal transform described by Wirtz are the result of multiplication and addition, they are linear operations.

It is noted that the multiplication of fast Fourier transform arrays involves a sum of products.

6. Claims 1-5, 10, 19, and 20 are rejected under 35 U.S.C. 102(e) as being anticipated by U.S. Patent Application Publication US 2001/0052928 A1 (Imagawa et al., hereinafter called Imagawa).

Applicant cannot rely upon the foreign priority papers (Japan 2001-025098, 2001-120496) to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

7. Regarding claim 1, Imagawa discloses the following:

An image processing method for evaluating matching between a template image (i.e. fig 18, Template Image) and an input image (i.e. fig. 18, Target Image) by use of a similarity value map (i.e. fig. 18, item L), comprising:

generating a first evaluation vector for said template image (i.e. fig. 18, item 82);

generating a second evaluation vector for said input image (i.e. fig. 18, item 92); and

performing an even-number times angular transformation on a component of an edge normal direction vector of said first and second evaluation vectors (i.e. The edge vector is normalized...using the formula of double angles, p. 12, paragraph 210, lines 1-2; even multiples of the angle θ, p. 13, para. 219, lines 10-13).

8. Regarding claim 2, Imagawa discloses the following:

An image processing method comprising:

inputting a specified image for a template image (i.e. fig. 18, Template Image);

inputting a specified image for an input image (i.e. fig. 18, Target Image);

calculating an edge normal direction vector of said specified image (i.e. edge normal vector, p. 12, para 205, lines 1-3; p. 14, para. 243, lines 3-4);

generating an evaluation vector from said edge normal direction vector (evaluation vector, p. 12, para. 206, line 4; p. 14, para. 243, line 9);

subjecting said evaluation vector to orthogonal transformation (i.e. FFT, fig. 18, items 83, 93);

performing a product sum calculation of corresponding spectral data for each evaluation vector that has been subjected to orthogonal transformation and has been obtained for said template image said input image (i.e. sum-of-product operation, p. 14, para. 245, line 7; fig. 18, item 101);

subjecting a result of said product sum calculation to inverse orthogonal transformation and generating a map of similarity values (i.e. Inverse FFT, fig. 18, item 102, map L); and

a formula of said similarity values, said orthogonal transformation, and said inverse orthogonal transformation each have linearity (i.e. the similar value L is linear, p. 13, para. 228, lines 1-5).

9. Regarding claim 3, Imagawa discloses the following:

The image processing method of Claim 2, further comprising compressing each evaluation vector that has been subjected to orthogonal transformation so as to reduce a processing amount (i.e. Compression Part, fig. 18, items 84, 94).

10. Regarding claim 4, Imagawa reveals the following:

The image processing method of Claim 2, wherein for said template image, the steps taken until said evaluation vector that has been subjected to orthogonal transformation is compressed are executed before said input image is input, and storing results thereof (see Recording Part, fig. 18, item 85, which is placed after the FFT and Compression Part).

11. Regarding claim 5, Imagawa reveals the following:

The image processing method of Claim 2, further comprising normalizing said evaluation vector with respect to a vector length (i.e. The evaluation vector generation part 82 first normalizes the edge normal vector, p. 12, para. 207, lines 1-3).

12. Regarding claim 10, Imagawa reveals the following:

The image processing method of Claim 2, wherein said template image

is an image of a typified face (i.e. the face extraction part 7 comprises a template image processing part, p. 11, para. 198, lines 3-4).

13. Regarding claim 19, Imagawa reveals the following:

An image processing apparatus comprising:

a template image processing part (fig. 18, item 80);

said template image processing part including means for inputting a template image (i.e. Template Image, fig. 18) and calculating an edge normal direction vector of said template image (i.e. edge normal vector, p. 12, para. 205, line 1), generating an evaluation vector from said edge normal direction vector (i.e. evaluation vector, p. 12, para. 206, line 4), subjecting said evaluation vector to orthogonal transformation (i.e. FFT, fig. 18, item 83), and compressing said evaluation vector that has been subjected to said orthogonal transformation so as to reduce the processing amount (i.e. Compression Part, fig. 18, item 84);

an input image processing part (fig. 18, item 90);

said input image processing part including means for inputting an input image (i.e. Target Image, fig. 18) and calculating an edge normal direction vector of said input image (i.e. edge normal vector, p. 14, para. 243, lines 3-4) generating an evaluation vector (evaluation vector, p. 14, para. 243, line 9) from said edge normal direction vector, subjecting said evaluation vector to orthogonal transformation (i.e. FFT, fig. 18, item 93), and compressing said evaluation vector that has been subjected to said

orthogonal transformation so as to reduce the processing amount (i.e. Compression Part, fig. 18, item 94);

multiplication means (fig. 18, item 101);

said multiplication means including means for performing a product sum calculation of corresponding spectral data about each evaluation vector that has been subjected to said orthogonal transformation and has been obtained for said template image and said input image (i.e. sum-of-product operation, p. 14, para. 245, line 7); and

inverse orthogonal transformation means (i.e. Inverse FFT, fig. 18, item 102);

said inverse orthogonal transformation means including means for subjecting a result of said product sum calculation to inverse orthogonal transformation and generating a map of similarity values (fig. 18, item L);

said evaluation vector including a component in which an edge normal direction vector of a specified image undergoes even-numbered times angular transformation (i.e. formula of double angles, p. 12, para. 210, lines 1-2; evaluating a representation of even multiples of the angle θ, p. 13, para. 219, lines 10-13), and a formula of said similarity values, said orthogonal transformation, and said inverse orthogonal transformation each have linearity (i.e. the similar value L is linear, p. 13, para. 228, lines 1-3).

14. Regarding claim 20, Imagawa discloses the following:

The image processing apparatus of Claim 19, wherein said template image processing part includes a recording means (i.e. Recording Part, fig. 18, item 85) for recording said evaluation vector that has been compressed to reduce a processing amount and that has been subjected to orthogonal transformation, and a result obtained by compressing said evaluation vector that has been subjected to orthogonal transformation is stored in said recording means before inputting said input image (i.e. the recording part 85 is provided in the template image processing part 80, to store an output of the compression part 84 prior to inputting the target image, p. 13, para. 237, lines 1-4).

Claim Rejections - 35 USC § 103

15. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

16. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of U.S. Patent 5,751,856 (hereinafter called Hirabayashi). Wirtz does not disclose the following:

The image processing method of Claim 2, further comprising

compressing each evaluation vector that has been subjected to orthogonal transformation so as to reduce a processing amount.

Although Wirtz discloses compression of the image template, this process occurs before the orthogonal transformation, and the input image is not compressed. However, Hirabayashi discloses an image compression method in which the Fourier transform is applied to the image, and then high frequencies are masked (col. 1, lines 26-39; col. 4, lines 27-39). This compresses the image and reduces the computations that are required for further processing (col. 1, lines 46-50). Wirtz and Hirabayashi are analogous art because they both involve image compression. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the methods of Wirtz and Hirabayashi because compressing the image would result in fewer calculations in subsequent processing steps.

17. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of Hirabayashi and further in view of U.S. Patent 5,909,501 (hereinafter called Thebaud). Wirtz discloses an embodiment with a stored template, but it is not explicitly stated in which form the template is stored (i.e. compressed or transformed). Neither Wirtz nor Hirabayashi disclose the following:

The image processing method of Claim 2, wherein for said template

image, the steps taken until said evaluation vector that has been subjected to orthogonal transformation is compressed are executed before said input image is input, and storing results thereof.

However, Thebaud reveals a template matching method in which preprocessed templates are stored as Fourier transforms. These stored templates are correlated with input images which are also Fourier transformed (col. 19, lines 60-65; col. 20, lines 20-30).

Wirtz, Hirabayashi, and Thebaud are analogous art because they involve image processing and orthogonal transforms; in particular, Wirtz and Thebaud both describe methods of template matching using Fourier transforms and correlation. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Thebaud with Wirtz and Hirabayashi because storing templates as Fourier transforms requires fewer calculations (Thebaud, col. 19, lines 60-62; col. 20, lines 20-22).

18. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of U.S. Patent 5,905,807 (Kado et al., hereinafter called Kado).

Wirtz does not disclose the following:

The image processing method of Claim 2, further comprising normalizing said evaluation vector with respect to a vector length.

However, Kado reveals the normalization of an edge vector with respect to an angle theta, a unit vector, and a zero vector (col. 5, lines 20-33). This edge vector is similar to the evaluation vector of the claim.

Wirtz and Kado are analogous art because they both describe a method of feature extraction using edge vectors. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz and Kado because adjusts for varying lighting conditions (col. 5, lines 34-39).

19. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of U.S. Patent 6,278,791 (Honsinger et al., hereinafter called Honsinger). Wirtz does not disclose the following:

> The image processing method of Claim 2, further comprising:
>
> reducing a data amount using complex conjugate properties of orthogonal transformation before performing a product sum calculation, and
>
> restoring said data amount after performing said product sum calculation.

However, Honsinger discloses a method in which the conjugate symmetry of the Fourier transform is used to eliminate redundant data (see col. 10, lines 52-63; fig. 6).

Wirtz and Honsinger are analogous art because they both involve image processing. In addition, Honsinger discloses a method of embedding data into an image, which is also a feature of claim 17. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz and Honsinger because this would reduce the amount of computation required.

20. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of U.S. Patent 5,781,650 (Lobo et al., hereinafter called Lobo).

Wirtz does not disclose the following:

> The image processing method of Claim 2, wherein said template image is an image of a typified face.

However, Lobo discloses a general face template used for identifying a face in an image (col. 4, lines 45-47; fig. 3).

Wirtz and Lobo are analogous art because they both describe methods of using templates to identify objects in images. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz with Lobo because this would enable the recognition of faces in images.

21. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of Kado. Wirtz does not disclose the features of claim 14; however, Kado reveals the following:

> For said template image, processing positive and negative signs of said evaluation vector of said original template image (see fig. 3, which contains a table of positive and negative gradient vectors representing a template of face parts); and
>
> Generating an evaluation vector of a bilaterally symmetrical image with respect to said original template image, by which said generated evaluation vector is applied to said product sum calculation (see col. 8,

lines 19-30, where Kado describes the properties of a bilaterally symmetrical face image).

Wirtz and Kado are analogous art because they both involve template matching with the use of edge vectors. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz with Kado because the face-matching method of Kado enables identification of faces in images.

22. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of Lobo and further in view of the article "Digital Image Watermarking on a Special Object: the Human Face" (Oh et al., hereinafter called Oh). Although Lobo identifies facial features in an image, he does not explicitly extract a face. Neither Lobo nor Wirtz reveal the features of claim 17. However, Oh reveals the following:

dividing said input image into only said face image and parts other than said face image on the basis of said extracted face image (i.e. face regions segmented out as a result of face detection, p. 538, section 2.1, paragraph 2, line 1; face detection step in fig. 2; see also section 2.2); embedding a digital watermark only into said face image (i.e. The face regions are divided into non-overlapping 8x8 sub-blocks and we cast a watermark bit in each sub-block, p. 540, section 2.3, paragraph 1, line 1); combining said face image into which said digital watermark has been

embedded with parts other than said face image to produce a combined result (i.e. The watermarked face regions are...overlaid on the original image at the same position, p. 538, section 2.1, paragraph 2, lines 4-5); and outputting said combined result (see final step “watermarked image” in fig. 2 on p. 538; see also watermarked image in fig. 5 on p. 542).

Wirtz, Lobo, and Oh are analogous art because they involve identification of objects in images. In particular, Lobo and Oh identify faces. Therefore, it would have been obvious to combine Wirtz and Lobo with Oh because watermarking enables authentication of images.

23. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of Lobo and further in view of U.S. Patent 5,990,901 (Lawton et al., hereinafter called Lawton).

Neither Wirtz nor Lobo reveal the following:

The image processing method of Claim 10, further comprising:

dividing said input image into only said face image and parts other than said face image on the basis of said extracted face image;

editing only said face image;

combining said face image after editing with parts other than said face image to produce a combined result; are

outputting said combined result.

However, Lawton describes a method in which an object (in particular, a face as in fig. 9) is selected and separately edited. The edited object is then combined

with the original image (col. 9, lines 48-65; fig. 2; fig. 3, item 121). It is understood that the previously stored image 58a in fig. 2 can be from the original image. Wirtz, Lobo, and Lawton are analogous art because they involve image processing. Thus it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the editing feature of Lawton with Wirtz and Lobo because this would result in improved images.

24. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of Hirabayashi. Wirtz discloses the following:

An image processing apparatus (i.e. gradient based image correlation system, col. 1, line 47; col. 2, lines 16-18) comprising:

a template image processing part;

said template image processing part including means for inputting a template image (i.e. reference image, col. 1, lines 57-58) and calculating an edge normal direction vector of said template image (i.e. a spatial gradient operation detects contrast boundaries in the reference image, col. 3, lines 4-5), generating an evaluation vector from said edge normal direction vector (i.e. convert the gradient vector to a complex number of the form (edge strength) exp (2i theta), col. 4, lines 24-25), subjecting said evaluation vector to orthogonal transformation (i.e. fast Fourier transform, col. 3, line 41)...

an input image processing part;

said input image processing part including means for inputting an input image and calculating an edge normal direction vector of said input image (i.e. application of a spatial gradient operator to the video image, col. 3, lines 26-27), generating an evaluation vector from said edge normal direction vector (i.e. convert the gradient vector to a complex number of the form (edge strength) exp (2i theta), col. 4, lines 24-25), subjecting said evaluation vector to orthogonal transformation (i.e. fast Fourier transform, col. 3, line 41)...

multiplication means (i.e. multiplication, col. 3, line 41);

said multiplication means including means for performing a product sum calculation of corresponding spectral data about each evaluation vector that has been subjected to said orthogonal transformation and has been obtained for said template image and said input image (i.e. multiplication of the fast Fourier transform arrays, col. 3, lines 41-42, in which addition is implied); and

inverse orthogonal transformation means (i.e. inverse transformation, col. 3, line 43);

said inverse orthogonal transformation means including means for subjecting a result of said product sum calculation to inverse orthogonal transformation and generating a map of similarity values (i.e. correlation-surface array, col. 3, line 47);

said evaluation vector including a component in which an edge normal direction vector of a specified image undergoes even-numbered times

angular transformation (i.e. convert the gradient vector to a complex number of the form (edge strength) exp (2i theta), col. 4, lines 24-25), and a formula of said similarity values, said orthogonal transformation, and said inverse orthogonal transformation each have linearity.

It is understood that since all the calculations regarding the edge vector are multiplication and addition, the process is linear.

Wirtz discloses the compression of template edge vectors in the spatial domain. He does not disclose the following features; however, these features are disclosed by Hirabayashi:

compressing said evaluation vector that has been subjected to said orthogonal transformation so as to reduce the processing amount (i.e. masking the high frequency portion, col. 1, lines 36-37);

Wirtz and Hirabayashi are analogous art because they both involve image compression. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz and Hirabayashi because compressing the image by masking high frequencies would require fewer calculations during subsequent processing of the image (col. 1, lines 45-49).

25. Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz in view of Hirabayashi and further in view of Thebaud. Wirtz and Hirabayashi do not reveal the following:

The image processing apparatus of Claim 19, wherein said template image processing part includes a recording means for recording said evaluation vector that has been compressed to reduce a processing amount and that has been subjected to orthogonal transformation, and a result obtained by compressing said evaluation vector that has been subjected to orthogonal transformation is stored in said recording means before inputting said input image.

However, Thebaud reveals a method in which a template is initially processed by performing a Fourier transform. The transformed template is then stored before it is compared to an input image (col. 20, lines 23-30).

Wirtz, Hirabayashi, and Thebaud are analogous art because they involve image processing. In particular, Wirtz and Thebaud both describe methods of template matching. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz and Hirabayashi with Thebaud because preparing the template in advance would result in a faster template matching process (col. 20, lines 20-22).

26. Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz and Hirabayashi and further in view of Thebaud and U.S. Patent 5,535,288 (Chen et al., hereinafter called Chen). Wirtz and Hirabayashi reveal the image processing apparatus of claim 19, but they do not reveal the features of claim 21. However, Chen reveals the following:

a conjugate compression means, between said recording means and said

multiplication means (see fig. 7, steps 3 and 7, which occur before multiplication step 9);

said conjugate compression means including means for reducing the data amount using complex conjugate properties of orthogonal transformation (i.e. conjugate symmetry, col. 9, lines 47-50, lines 60-64);

a conjugate restoring means (this is implied in the IDFT operation described in col. 10, lines 4-11);

said conjugate restoring means, between said multiplication means and said inverse orthogonal transformation means, including means for restoring the data amount reduced by use of the complex conjugate properties of orthogonal transformation (see fig. 7, step 11, which occurs between the multiplication step 9 and the IDFT step 12).

Chen does not include a storage means for a template. However, such a storage means is disclosed by Thebaud, as discussed in the response to claim 20. Chen and Thebaud are analogous art because they both involve pattern matching. Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Chen with Thebaud because a stored template would result in a more efficient pattern matching process (col. 20, lines 20-22).

Wirtz, Hirabayashi, and Chen are analogous art because they involve image processing with Fourier transforms. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz and Hirabayashi with Chen because conjugate compression results in greater

efficiency (col. 6, line 27), in particular, fewer calculations during the multiplication process (col. 10, lines 1-3).

27. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz, Hirabayashi, Thebaud, and further in view of Kado. Claim 27 is similar to claim 14, except for its dependency and its description of an apparatus rather than a method. Since the apparatus of claim 27 performs the same function as the method of claim 14, claim 27 is rejected on the same basis as claim 14.

Regarding dependency of claim 27, Wirtz, Hirabayashi, Thebaud, and Kado are analogous art because they involve image processing. Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine the prior art cited above because the apparatus of Kado allows faces to be identified in images.

28. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz and Hirabayashi and further in view of Oh. Wirtz and Hirabayashi do not reveal the features of claim 30, but they are revealed by Oh as shown below. See also the response to claim 17, which contains the same features.

> A face image cutting-out means for separating an input image into only a face image and parts excluding said face image on the basis of an extracted face image (p. 538, section 2.1, paragraph 2, line 1);

A digital watermark embedding means for embedding a digital watermark only into the face image (p. 540, section 2.3, paragraph 1, line 1); and

An image synthesizing means for combining said face image into which said digital watermark has been embedded with parts excluding said face image and outputting the combined data (p. 538, section 2.1, paragraph 2, lines 4-5; p. 542, fig. 5, image labeled “watermarked image”).

Wirtz, Hirabayashi, and Oh are analogous art because they involve image processing. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz and Hirabayashi with Oh because the watermarking method of Oh would result in images that can be authenticated.

29. Claim 31 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz and Hirabayashi and further in view of Lawton. Wirtz and Hirabayashi do not reveal the features of claim 31. The features of this claim are similar to those of claim 18, except that they apply to an apparatus rather than a method and they depend on a different claim. Lawton reveals the following:

a face image cutting-out means for separating an input image into only a face image and parts excluding said face image on the basis of an extracted face image (i.e. registration of the area with the selected model, col. 9, lines 30-33);

an image correction means for editing only said face image (i.e. correcting for awkward facial expressions, col. 3, lines 6-9; editing techniques for

correcting imperfections or flaws in an object of the original image, col. 9, lines 20-22); and

an image synthesizing means for combining an edited face image with parts excluding said face image and outputting them (i.e. pasting an object into the original image...either to correct a part of the original image or to just add attributes to the original image, col. 9, lines 48-58, where it is understood that a previously stored image pasted into the original image matches the original face).

Wirtz, Hirabayashi, and Lawton are analogous art because they involve image processing. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Wirtz and Hirabayashi with Lawton because the automated editing feature of Lawton would produce improved images.

30. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz and Lobo and further in view of U.S. Patent 6,529,630 (hereinafter called Kinjo) and further in view of U.S. Patent Publication 2001/0014182 A1. (Funayama et al., hereinafter called Funayama). Wirtz and Lobo do not reveal the features of claim 32. However, Kinjo reveals the following:

cutting out a face image from said input image on the basis of an extracted face image (i.e. a face candidate region is extracted, col. 20, lines 58-59);

calculating a feature that corrects said face image on the basis of said extracted face image (i.e. constructs density [brightness] histograms, col. 19, lines 44-47);

determining a correction function on said basis of said obtained feature (i.e. density adjustment, col. 19, line 54); and

applying image correction based on said determined correction function at least onto said face image that has been cut out (i.e. various image processing schemes and steps to be implemented in the prescanned image processing section and the fine scanned image processing section, col. 19, lines 57-59).

Kinjo does not reveal the following:

extracting a facial inner image from said face image that has been cut out;

However, Funayama reveals a region of a face used to obtain color characteristics of the face (p. 6, paragraph 101, lines 12-14; region 9-5 in fig. 13B).

Wirtz, Lobo, Kinjo, and Funayama are analogous art because they involve image processing. Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to combine Kinjo with Wirtz and Lobo because the image enhancement method of Kinjo corrects flaws in face images. It would have been similarly obvious to combine Funayama with Wirtz and Lobo because the extraction method of Funayama enables measurement of brightness and color properties of the face image.

31. Regarding claim 33, which depends on claim 32, Funayama also reveals the following:

said feature is a combination of at least two of brightness, chroma average, and hue average (i.e. the image processing section calculates the mean and variance of each of the hue, color saturation and brightness, p. 7, paragraph 101, lines 27-29).

32. Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wirtz and Hirabayashi and further in view of Kinjo and further in view of Funayama. Claim 34 is similar to claim 32, except that claim 34 describes an apparatus instead of a method. Also, claim 34 is dependent on an apparatus claim. Since the apparatus of claim 34 performs the same function as the method of claim 32, it is rejected on the same basis. The motivation for combining Kinjo and Funayama with Wirtz and Hirabayashi is similar to the justification given to combine references in claim 32.

33. Claim 35 is similar to claim 33, except that it describes an apparatus instead of a method. Because the apparatus of claim 35 performs the same function as the method described in claim 33, it is rejected on the same basis. Also, claim 35 depends on claim 34, which is revealed in part by Funayama.

Allowable Subject Matter

34. Claims 6, 8, 9, 11-13, 15,16, 22-26, 28, and 29 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following subject matter could not be found in the prior art:

Claim 6

Normalizing said evaluation vector of said template image by the number of edge normal direction vectors.

Claim 8

Subjecting said evaluation vector of each size to addition processing.

Claim 9

Said addition processing of said evaluation vector is carried out after executing said step of compressing each evaluation vector so as to reduce the processing amount.

Claim 11

Preparing a peak pattern that makes a peak of said similarity value steep; and subjecting data of said peak pattern to orthogonal transformation to said

product sum calculation.

Claim 12

Forming a mask pattern that depends on said template image; and

subjecting data of this mask pattern to orthogonal transformation to said

product sum calculation.

Claim 13

Said mask pattern includes an average of a number of pixels in an image of said

template image.

Claim 15

Generating a map of point biserial correlation coefficients on the basis of an

extracted face image; and

responsive to said correlation coefficients, calculating a position of said

face part.

Claim 16

Calculating a distribution of projection values in a y-direction on the basis

of said extracted face image by use of said mask pattern;

calculating two maximum points from said distribution; and

outputting a range between said two maximum points as a mouth range.

Claim 22

An addition means for performing addition processing of said evaluation vector of each size.

Claim 23

Said addition means includes means for performing addition processing of said evaluation vector of said template image after compressing said vector so as to reduce the processing amount.

Claim 24

A peak pattern processing part for subjecting a peak pattern by which a peak of a similarity value is made steep to orthogonal transformation and compressing said peak pattern that has been subjected to said orthogonal transformation so as to reduce the processing amount, wherein a result obtained by subjecting data of this peak pattern to said orthogonal transformation is applied to a product sum calculation of said multiplication means.

Claim 25

Said mask pattern processing part including means for forming a mask pattern that depends on said template image and generating data obtained by subjecting data of this mask pattern to orthogonal transformation and by compressing it, wherein a processing result of said mask pattern processing part is applied to a product sum calculation of said multiplication means.

Claim 26

Said mask pattern includes a mean of a number of pixels inside an image of said template image.

Claim 28

A η map forming means for forming a map of a point biserial correlation coefficient on the basis of an extracted face image, and an extraction means for calculating a position of a face part from the formed map.

Claim 29

A maximum point extraction means for calculating a projection value distribution in a y direction by use of a mask pattern on the basis of an extracted face image, and

calculating two maximum points from this distribution, and outputting a range between said maximum points such as a mouth range.

Other Prior Art

35. U.S. Patent 6,195,460 (Kobayashi et al.) describes an apparatus that performs image template matching, orthogonal transformation, and correlation using a mask.

U.S. Patent 5,296,945 (Nishikawa et al.) discloses an apparatus which modifies the color of a face based on the properties of a subregion of the face (fig. 6A, item Q). This subregion is similar to the facial inner image described in claim 32.

Japanese Patent JP411328359A (Takemoto) describes a method that extracts a face from an image, performs skin color correction, and recombines the corrected face with the rest of the image. This relates to claim 31.

36. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael W. Bowen whose telephone number is (571)272-5969. The examiner can normally be reached on M-F 8AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta can be reached on (571)272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MWB

BHAVESH M. MEHTA
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600